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URBANA

REPORT OF INVESTIGATIONS — NO. 51

ILLINOIS MINERAL INDUSTRY IN 1937

A Preliminary Statistical Summary and
Economic Review

BY

WALTER H. VOSKUIL, ALMA R. SWEENEY AND G. N. OLIVER



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ILLINOIS MINERAL INDUSTRY IN 1937

A PRELIMINARY STATISTICAL SUMMARY AND ECONOMIC REVIEW

WALTER H. VOSKUIL, ALMA R. SWEENEY AND G. N. OLIVER

INTRODUCTION

THE mineral industry in Illinois gained substantially in value of output in 1937 over the previous year. In spite of a marked decline in industrial productivity in the latter part of 1937, gains were registered in coal output, sand and gravel production, petroleum, limestone, mineral wool and minor mineral products. Cement output fell slightly from the previous year, as did also natural gasoline, lime and fluorspar. Due to the development of oil production in the Illinois basin, the greatest gain was registered by petroleum. The small increases, or losses, occurred mainly in materials used in the construction industry. A summary of output and value at the source of the principal minerals produced in Illinois in 1937 is shown in table 1.

ACKNOWLEDGMENTS

This report is made possible through the cooperation of the Bureau of Mines of the U. S. Department of the Interior, the Bureau of the Census of the U. S. Department of Commerce, the Illinois State Department of Mines and Minerals, and through the generous cooperation of the producers of the State in responding to requests for information.

STATUS OF FUELS IN 1937

COAL

The national output of bituminous coal in 1937 was 442,455,000 tons as compared with 434,070,000 tons in 1936. Output in 1937 exceeded that of 1936 for the first three months of the year and paralleled it until the close of the year, when the sharp recession in business activity made itself felt in orders for coal. Production in Illinois was 51,240,000 tons, a gain of 714,000 tons over the previous year. Production for the five-year period 1933-1937 for the nation and the State of Illinois is shown in table 2.

TABLE 1.—SUMMARY OF PRODUCTION AND VALUE OF ILLINOIS MINERALS, 1936-37

	1936		1937	
	Amount ^a	Value	Amount ^a	Value
Coal.....	50,526,000	\$78,820,560	51,240,000	\$80,960,000
Pig iron.....	2,991,740	54,583,804	3,357,959	70,893,278
Clay products.....	11,513,411	11,513,411	11,958,913	11,958,913
Coke.....	2,082,516	13,098,787	2,100,000	13,230,000
Cement, Portland (barrels).....	4,949,318	7,056,344	4,713,734	6,756,747
Sand and gravel (total).....	12,418,495	6,017,468	14,333,482	7,486,610
Structural sand.....	1,776,853	741,682	1,353,913	641,718
Paving and road-making sand.....	1,134,658	428,225	1,226,798	541,621
Glass sand.....	536,873	628,345	628,020	757,138
Moulding sand.....	687,384	591,756	914,750	855,017
Railroad ballast sand.....	411,725	99,915	318,839	88,432
Grinding, polishing and blast sand.....	151,530	439,601	132,002	394,263
Engine sand.....	67,344	34,455	54,975	33,329
Fire or furnace sand.....	(^b)	(^b)	10,836	12,189
Other sands.....	191,359	178,231	192,869	185,112
Structural gravel.....	1,988,747	882,543	1,576,257	773,051
Paving and road-making gravel.....	4,155,618	1,597,485	6,814,600	2,783,383
Railroad ballast gravel.....	1,298,602	388,612	1,085,331	418,578
Other gravel.....	17,802	6,618	24,292	2,779
Petroleum (barrels).....	4,445,000	5,467,350	7,426,000	9,870,000
Limestone (total).....	9,234,510	7,235,505	9,819,730	8,335,094
Road metal and concrete.....	6,823,140	5,427,112	7,251,861	6,197,969
Flux.....	393,760	219,829	402,611	250,053
Railroad ballast.....	568,570	376,009	589,185	416,755
Riprap.....	181,600	180,383	192,467	216,713
Rubble.....	340	609	350	666
Agriculture.....	1,081,600	846,227	1,031,070	916,860
Other uses.....	185,500	185,336	352,179	336,078
Rock wool.....		190,000		215,000
Mineral paints, zinc and lead pigments.....	(^b)	(^b)	(^b)	(^b)
Natural gasoline (gallons).....	2,330,869	134,505	83,201	112,347
Natural gas (M cu. ft.).....				
Lime (total).....	144,675	1,057,765	142,122	1,039,087
Building.....	21,005	173,912	20,608	170,410
Tanneries.....	12,930	96,235	12,649	93,518
Metallurgy.....	53,951	361,609	52,585	353,289
Paper mills.....	8,240	45,210	8,101	43,642
Other uses.....	48,549	380,799	47,179	378,228
Feldspar (ground).....			(^b)	(^b)
Fluorspar.....	82,056	1,525,606	78,664	1,730,585
Quartz (silica).....	82,877	483,952	96,329	575,251
Clay (raw).....	126,396	278,996	161,537	339,706
Tripoli.....	10,981	138,063	11,647	151,154
Lead and silver.....		28,427		22,634
Sandstone.....	25,400	30,952	23,150	33,584
Zinc.....				
Pyrites.....	9,472	15,660	(^b)	(^b)
Other minerals.....		28,554		162,322
Total value.....		\$120,023,118		\$129,749,034

^a In tons except as noted.^b Included in other uses.

TABLE 2.—COAL PRODUCTION, 1933-37^a
(Thousands of net tons)

Year	UNITED STATES		Illinois	Per cent of bituminous output
	Anthracite	Bituminous		
1933.....	49,541	333,631	37,413	11.2
1934.....	57,168	359,368	41,252	11.4
1935.....	52,159	372,373	44,525	12.0
1936.....	54,760	434,070	50,526	11.6
1937.....	50,915	442,455	51,240	11.6

^a Data from Minerals Yearbooks, U. S. Dept. Interior, Bu. Mines.

PETROLEUM AND REFINED PRODUCTS

Petroleum and its products showed a substantial increase in 1937 over 1936. The principal items of output in the petroleum industry are shown in table 3.

TABLE 3.—PRODUCTION OF CRUDE PETROLEUM AND REFINED PRODUCTS^a
(Thousands of barrels)

	1936	1937
Crude petroleum:		
Domestic production.....	1,099,687	1,277,653
Natural gasoline.....	42,770	48,550
Benzol.....	2,502	2,786
Total production.....	1,144,959	1,328,989
Foreign trade in crude petroleum:		
Imports.....	32,327	27,484
Exports.....	50,313	67,686
Excess of exports over imports.....	17,986	40,202
Production, refined products:		
Gasoline.....	516,266	570,979
Kerosene.....	56,082	65,308
Gas, oil and distillate fuels.....	125,906	146,706
Residual fuel oils.....	287,968	310,161
Exports and Imports of Refined products		
Exports:		
Motor fuel.....	28,646	39,974
Kerosene.....	6,936	8,907
Gas, oil and distillate fuels.....	20,448	30,024
Residual fuel oils.....	14,435	15,304
Total exports.....	70,465	92,209
Imports, all refined products:		
Receipts in bond.....	18,639	22,352
Receipts for domestic use.....	6,138	7,316
Total receipts.....	24,777	29,668

^a Source of data, U. S. Dept. Interior, Bu. Mines, Monthly petroleum statement No. 167, Feb. 9, 1938.

TABLE 4.—NATURAL GAS OUTPUT^a
(Millions of cubic feet)

	1936	1937 ^b
Production.....	2,167,802	.....
Consumption:		
Domestic and commercial use.....	454,969	.....
Field (drilling, pumping, etc.).....	618,468	.....
Manufacture of carbon black.....	283,421	.....
Used at petroleum refineries.....	93,183	.....
Electric public utility power plants.....	156,080	.....
Other industrial.....	554,397	.....

^a Source of data, U. S. Dept. Interior, Bu. Mines, Mineral Market Reports, No. M.M.S. 626, Jan. 20, 1938.

^b Not available.

TABLE 5.—HYDROELECTRIC POWER OUTPUT^a
(Millions of kilowatt hours)

	1936	1937
United States, total electric power output.....	113,602	117,791
Hydroelectric power output, United States.....	40,937	43,418
Hydroelectric power output, by states in the Illinois coal area:		
Illinois.....	242	93
Indiana.....	104	148
Wisconsin.....	858	889
Minnesota.....	518	547
Iowa.....	701	721
Missouri.....	222	579
North Dakota.....	0	0
South Dakota.....	9	9
Total in Illinois coal market area.....	2,654	2,986

^a Source of data, Federal Power Commission, Bu. Engineering, Monthly and Annual Production of Electricity for Public Use in the United States in 1936, April 12, 1937.

Hydro-electric power is not an important contribution to the power supply in the states comprising the Illinois coal market area. If the coal equivalent of electricity generated by water power in these states is calculated at 1.43 pounds of coal per kilowatt hour of electricity, the coal displacement by water power, generating 2,986,000,000 kilowatt hours in 1937 is 2,134,990 tons. The consumption of fuels for electric utility plants in the same states, in 1937 was as follows:

Coal.....	12,286,065 tons
Fuel oil, 733,816 barrels, equivalent to approximately....	181,300 tons of coal
Natural gas, 27,159,552,000 cubic feet, equivalent to approximately.....	1,086,300 tons of coal

COAL INDUSTRY IN ILLINOIS

In table 7 is shown the monthly output of coal by counties and by months from shipping mines in Illinois.

In table 8 is given the comparative data on monthly production by shaft and strip mines for 1936 and 1937. Table 10 shows the number of men working each month in the two types of mines. Particularly noticeable has been the rise in employment in strip mines and a decline in employment in the shaft mines.

PRODUCTION OF COAL IN ADJACENT STATES

Coal production in adjacent states in the Interior coal basin increased slightly in 1937 over 1936, although two states—Indiana and North Dakota—registered small declines.

TABLE 6.—PRODUCTION OF COAL IN STATES ADJACENT TO ILLINOIS^a
(Thousands of net tons)

	1936	1937
Arkansas and Oklahoma.....	3,125	3,200
Indiana.....	17,410	17,270
Iowa.....	3,550	3,650
Kansas and Missouri.....	6,650	7,044
Western Kentucky.....	8,266	8,283
North Dakota.....	2,258	2,105

^a Data from U. S. Dept. Interior, National Bituminous Coal Commission, Weekly Coal Reports.

DISTRIBUTION

Coal consumed in the Illinois coal market area is received from the northern and southern fields of the eastern coal-producing districts, from Illinois, Indiana, and western Kentucky, and, in smaller quantities, from the coal-producing states of Iowa, Missouri, North Dakota, Kansas, Arkansas, Wyoming, Colorado and Montana. Of the all-rail shipments of coal into this area in 1937, the Central and Southern Illinois field supplied 44 per cent, the remainder being divided as follows:

New Run—Winding Gulf and Pocahontas-Tug River, 19 per cent;
 Harlan, Hazard & Southern Appalachian, 9 per cent;
 Northern Illinois, 7 per cent;
 Indiana, 11 per cent;
 Western Kentucky, 3 per cent;
 Nine eastern coal-producing districts in Pennsylvania, Ohio, West Virginia and Kentucky, 7 per cent.

In table 9 is given detailed data on all-rail shipments from producing fields to consuming markets in the Illinois coal market area in 1936 and 1937.

TABLE 7.—BITUMINOUS COAL PRODUCTION BY SHIPPING
(Net)

County	January	February	March	April	May
Christian.....	447,229	467,130	560,344	267,156	284,640
Clinton.....	40,234	40,711	42,169	7,328	2,839
Franklin.....	1,134,826	1,218,987	1,387,659	338,792	424,250
Fulton.....	290,853	312,734	382,784	105,913	113,861
Henry.....	51,741	48,593	51,275	24,134	27,349
Jackson.....	151,802	161,906	201,333	51,084	63,729
Knox.....	63,635	79,059	94,850	27,516	38,291
LaSalle.....	39,045	43,097	65,990	15,248	9,963
Macoupin.....	443,184	445,226	508,309	190,661	170,635
Madison.....	171,088	174,127	187,012	75,699	36,949
Marion.....	45,976	44,831	55,915	6,718	(b)
Montgomery.....	114,168	114,223	134,940	59,500	46,203
Peoria.....	135,684	138,193	155,963	(b)	(b)
Perry.....	368,432	401,269	502,904	136,982	167,163
Randolph.....	110,657	140,147	192,068	37,203	49,440
Saline.....	393,069	249,393	497,552	153,641	121,943
Sangamon.....	294,326	314,103	373,189	97,122	95,638
St. Clair.....	238,098	254,992	310,207	78,550	62,844
Tazewell.....	17,828	16,137	16,518	(b)	(b)
Vermilion.....	227,103	219,679	249,637	87,719	94,785
Washington.....	45,198	45,990	51,577	3,444	(b)
Williamson.....	242,741	279,172	333,665	91,584	92,303
Woodford.....	10,756	—	—	—	(b)
Other Counties.....	171,389	180,931	162,444	162,444	164,265
Total.....	5,279,062	5,390,630	6,518,304	1,967,339	2,067,090
Strip Mines.....	933,718	1,025,724	1,333,610	450,703	550,598
Shaft Mines.....	4,345,344	4,364,906	5,184,694	1,516,636	1,516,492

(Table continued on page 13)

TABLE 8.—OUTPUT OF COAL BY

	January	February	March	April	May
Total output, 1936.....	5,227,017	5,441,892	3,773,144	3,023,452	2,333,640
Total output, 1937.....	5,279,062	5,390,630	6,518,304	1,967,339	2,067,090
Change.....	+52,045	—51,262	+2,745,160	—1,056,113	—266,550
Shaft mines, 1936.....	4,343,946	4,625,228	3,065,175	2,425,983	1,837,556
Shaft mines, 1937.....	4,345,344	3,364,906	5,184,694	1,516,636	1,516,452
Change.....	+ 1,398	—260,322	+2,119,519	—909,347	—321,064
Strip mines, 1936.....	883,071	816,664	667,969	597,469	496,084
Strip mines, 1937.....	933,718	1,025,724	1,333,610	450,703	550,598
Change.....	+50,647	+209,060	+665,641	—146,766	+54,514

(Table continued on page 13)

MINES IN ILLINOIS BY COUNTIES AND MONTHS FOR 1937^a

tons)

June	July	August	September	October	November	December	Total
364,308	332,729	447,728	394,174	393,636	346,543	403,175	4,738,792
5,065	5,866	10,077	18,967	32,677	23,069	30,583	259,583
473,019	567,731	686,041	821,162	1,030,785	958,042	1,068,629	10,109,923
174,924	177,598	218,900	267,427	299,046	252,024	339,598	2,935,662
55,729	55,914	49,052	59,075	67,791	56,385	65,058	612,196
57,284	116,660	140,656	156,844	161,732	162,413	173,635	722,261
45,789	53,454	61,774	71,430	63,928	63,571	58,964	1,599,078
9,463	10,664	24,141	31,880	36,582	35,124	52,162	373,359
186,402	207,162	37,468	271,823	316,315	348,830	389,105	3,515,120
45,600	48,234	41,560	119,367	138,946	113,956	135,725	1,288,263
(b)	(b)	(b)	.....	(b)	26,255	38,453	317,523
39,116	39,732	49,067	77,826	67,673	76,424	109,714	928,586
54,219	64,803	76,516	82,541	98,345	106,501	118,006	1,112,369
230,762	237,508	261,314	325,245	386,722	389,307	433,231	3,842,839
66,496	95,311	96,065	122,986	131,184	140,874	164,690	1,347,121
183,717	187,869	99,426	332,650	380,812	401,457	448,194	3,449,723
103,992	80,757	135,969	169,024	205,802	209,819	256,686	2,336,427
84,350	82,608	89,914	169,591	192,842	188,393	246,229	1,998,618
(b)	(b)	5,874	11,226	11,666	12,461	17,860	126,008
99,236	116,533	142,211	164,779	153,335	145,829	157,542	1,858,388
(b)	8,892	27,473	30,994	31,773	32,455	25,477	310,826
115,556	127,951	159,948	209,906	235,072	221,182	284,912	2,393,992
(b)	(b)	(b)	73,332	8,091	8,729	11,222	70,876
77,162	114,497	143,934	171,218	204,604	170,230	192,902	2,254,928
2,492,189	2,732,473	3,005,108	4,087,467	4,651,359	4,489,871	5,221,852	48,502,470
669,991	718,388	750,706	1,008,340	1,123,555	1,027,773	1,221,062	10,814,168
1,822,198	2,014,085	2,254,402	3,079,127	3,527,804	3,462,098	4,000,790	37,688,302

^a Compiled from Monthly Reports of Coal Production, Illinois State Department of Mines and Minerals, Springfield, Illinois.

^b Tonnage included in other counties.

^c Only one shipping mine operating June 1936 and May 1937.

MONTHS AND BY TYPES OF MINES, 1936 AND 1937^a

June	July	August	September	October	November	December	Year
2,587,551	2,927,413	3,262,884	3,517,873	4,799,164	4,741,897	5,733,619	47,329,546
2,492,189	2,732,473	3,005,108	4,087,467	4,651,359	4,489,871	5,221,852	48,502,470
-95,362	-194,940	-257,776	+569,594	-147,805	-252,026	-511,767	+1,172,924
2,048,041	2,381,167	2,705,435	2,882,300	3,951,695	3,874,976	4,630,909	38,772,411
1,822,198	2,014,085	2,254,402	3,079,127	2,527,804	3,462,098	4,000,790	37,688,302
-225,843	-367,082	-451,033	+196,827	-423,891	-412,878	-630,119	-1,084,109
539,510	546,246	557,449	635,573	847,469	866,921	1,102,710	8,557,135
669,991	718,388	750,706	1,008,340	1,123,555	1,027,773	1,221,062	10,814,168
+130,481	+172,142	+193,257	+372,767	+276,086	+160,852	+118,352	+2,257,033

^a Monthly Report of Shipping Mines, State of Illinois, Department of Mines and Minerals, June, 1938.

TABLE 9.—ORIGIN AND DESTINATION OF REVENUE RAILROAD SHIPMENTS OF
(Exclusive of non-
(Net

From	Chicago District	Illinois other ^b	Mil- waukee, Wis.	Wis- consin, other	Council Bluffs, Iowa
<i>1936</i>					
Western Pennsylvania.....	55,839	2,014	.....	103	.....
Central Pennsylvania, Somers- et-Myersdale and Cumber- land-Piedmont.....	40,504	6,081	453	11,044	810
Fairmont (W. Va.).....	34,188	8,945	92	2,861	.....
Northern and eastern Ohio....	4,088	1,148	.....	859	.....
Southern Ohio.....	6,772	87	.....	588	.....
Kanawha, (W. Va.), Logan and Kenova-Thacker (W. Va.- E. Ky.).....	963,093	119,137	2,849	41,501	1,186
New River-Winding Gulf and Pocahontas-Tug River.....	7,311,836	415,003	162,999	660,394	46
Northeast Kentucky and Mc- Roberts.....	1,027,008	113,871	619	50,535	103
Virginia.....	81,644	16,583	1,270	48,159	.....
Harlan and Hazard (E. Ky.)...	2,897,443	405,341	1,974	55,508	440
Northern Illinois.....	561,007	2,163,494	1,920	133,652	103
Central and southern Illinois...	6,321,257	7,379,486	42,230	1,096,765	62,131
Indiana.....	3,056,707	1,164,091	85,704	378,049	194
Western Kentucky.....	509,608	353,782	3,352	200,396	7,238
Total.....	22,870,994	12,149,063	303,462	2,680,414	72,251
<i>1937</i>					
Western Pennsylvania.....	2,278	559	72	231	.....
Central Pennsylvania, Somers- et-Meyersdale and Cumber- land Piedmont.....	55,591	4,561	379	6,391	847
Fairmont, W. Va.....	144,680	5,075	46	3,564	.....
Northern and eastern Ohio....	3,367	2,064	.....	1,178	.....
Southern Ohio.....	1,938	100	.....	393	.....
Kanawha, Logan and Kenova- Tracker.....	1,335,229	104,980	708	32,969	586
New River-Winding Gulf and Pocahontas-Tug River.....	8,213,952	415,370	102,406	559,587	.....
Northeast Kentucky and Mc- Roberts.....	1,074,707	105,693	308	45,465	.....
Virginia.....	217,398	32,455	2,687	52,747	.....
Hazard, Harlan and Southern Appalachians.....	3,530,670	396,185	1,375	41,897	396
Ex-river coal.....	136	925	.....	116	.....
Northern Illinois.....	546,388	2,161,089	1,173	152,325	144
Central and Southern Illinois..	6,196,423	7,708,571	38,369	1,114,757	42,720
Indiana.....	2,924,433	1,251,039	114,253	471,166	434
Western Kentucky.....	532,936	302,017	6,083	186,442	5,554
Grand Total.....	24,780,124	12,490,683	267,859	2,669,228	50,681
Per cent of change over 1936...	+8.3	+2.8	-11.7	— .4	-29.9

^a Data from National Bituminous Coal Commission, Monthly Coal Distribution Report No. 79.

^b Includes Davenport, Iowa for shipments from Ohio and the Crescent and includes Davenport, Bettendorf, and Iowa, Iowa for shipments from Illinois, Indiana and Western Kentucky; excludes East St. Louis, Illinois.

COAL FROM ILLINOIS, INDIANA, AND KENTUCKY, AND FROM THE APPALACHIANS^a
revenue railroad fuel)
(tons)

Iowa, other	St. Louis, Mo.	Kan- sas City, Mo.	St. Joseph, Mo.	Mis- souri, other	Kan- sas, other	Ne- braska, other	Minne- sota	South Da- kota	North Da- kota
1936									
913							59		
8,398	3,359	1,106	388	2,099	1,740	1,349	5,836	1,296	
3,458						42	648	185	
7,250							52	45	
4,677							702		
215,947	51,086		175	1,961		403	19,325	1,972	
94,360	106,905			832		206	162,077	15,577	
210,405	165,260		48	67		850	31,046	5,361	
8,514	102						17,790	2,468	
625,446	11,705			2,155		1,692	56,890	8,332	
612,925	102			2,010		5,203	65,727	3,418	537
1,872,542	3,753,468	2,057	22,935	1,043,318	21,589	131,253	491,205	135,926	2,396
441,390	54,391	211		3,593		2,819	100,779	4,014	320
273,615	86,990	533	43	39,453		12,962	52,721	24,501	5,647
4,379,840	4,233,368	3,907	23,589	1,095,488	23,329	156,779	1,004,857	204,095	8,900
1937									
9,711	5,082	1,029	374	1,609	1,552	1,200	4,234	975	
2,220							140		
6,157							207	101	
1,114							254		
189,336	52,076			25,979		188	12,906	2,666	
79,918	126,113			20,377	75	48	103,613	10,525	
180,344	128,125			658		618	24,242	1,834	
7,451	290						18,149	2,350	
569,956	17,562			914		1,571	46,183	8,155	
	28						27		
733,675	52			2,557		4,130	61,375	2,423	178
1,716,738	3,950,328	1,713	12,888	996,016	17,689	105,953	503,610	122,650	1,662
446,575	58,969	199		4,703		2,014	95,140	1,731	97
282,440	75,605	50	303	44,092		6,875	73,287	21,329	4,185
4,225,635	4,414,230	2,991	13,565	1,096,905	19,316	122,597	943,347	174,739	6,122
-3.5	+4.3	-23.4	-42.5	+1	-17.2	-21.8	-6.1	-14.4	-31.2

TABLE 10.—EMPLOYMENT, BY MONTHS

Number of employees	January	February	March	April
All mines, 1936.....	36,686	37,205	37,400	30,478
All mines, 1937.....	35,954	35,663	35,520	25,253
Change.....	-732	-1,542	-1,880	-5,225
Strip mines, 1936.....	2,211	2,263	2,224	2,040
Strip mines, 1937.....	2,711	2,637	2,718	2,664
Change.....	+500	+374	+494	+624
Shaft mines, 1936.....	34,475	34,942	35,266	28,438
Shaft mines, 1937.....	33,243	33,026	32,802	22,589
Change.....	-1,232	-1,916	-2,464	-5,849

(Table continued on page 17)

ORIGIN OF LAKE CARGO COAL

The high and low volatile fields of West Virginia and eastern Kentucky continue to dominate the lake trade in spite of the handicap of higher freight rates to lower lake ports. Lack of a local market and the suitability of these coals for coking purposes and for domestic heating account for the heavy shipments.

TABLE 11.—SUMMARY OF COAL SHIPMENTS, BY FIELDS OF ORIGIN, INTO THE ILLINOIS COAL MARKET AREA (1936-37)^a
(Tons of 2,000 pounds)

From:	1936	1937	Change (Per cent)
Western Pennsylvania.....	58,928	3,140	-95.0
Central Pennsylvania, Somerset-Meyersdale, and Cumberland-Piedmont.....	84,463	93,535	+11.0
Fairmont, W. Va.....	50,419	155,725	+209.0
Northern and eastern Ohio.....	13,442	13,074	-2.7
Southern Ohio.....	12,826	3,799	-70.4
Kanawha (W. Va.), Logan and Kenova-Thacker (W. Va.-E. Ky.).....	1,418,635	1,757,623	+24.0
New River-Winding Gulf and Pocahontas-Tug River.....	8,930,235	9,631,984	+8.0
Northeast Kentucky and McRoberts.....	1,605,173	1,561,994	-2.7
Virginia.....	176,530	333,527	+89.0
Harlan and Hazard (E. Ky.).....	4,066,926	4,614,864	+13.4
Northern Illinois.....	3,550,098	3,665,509	+3.2
Central and southern Illinois.....	22,379,558	22,540,087	+0.7
Indiana.....	5,292,262	5,370,753	+1.5
Western Kentucky.....	1,570,841	1,541,196	-1.8
Total.....	49,210,336	51,278,022	

^a Source of data, National Bituminous Coal Commission, Monthly Coal Distribution Report No. 79.

IN MINES, BY TYPES, 1936 AND 1937^a

May	June	July	August	September	October	November	December
27,612	27,997	29,055	28,983	31,834	34,466	35,607	36,361
24,364	24,627	24,501	26,271	30,417	33,088	33,850	.....
-3,248	-3,370	-4,554	-2,712	-1,417	-1,378	-1,757	.....
2,078	2,030	1,976	2,015	2,178	2,245	2,337	2,313
2,564	2,876	2,547	2,612	2,690	2,721	2,749	.....
+486	+846	+571	+597	+512	+476	+412	.....
25,534	25,967	27,079	26,968	29,656	32,221	33,270	34,048
21,800	21,751	21,954	23,659	27,727	30,367	31,101	.....
-3,734	-4,216	-5,125	-3,309	-1,929	-1,854	-2,169	.....

^a Monthly Report of Shipping Mines, State of Illinois, Department of Mines and Minerals, June, 1938.

LAKE CARGO SHIPMENTS

Shipments of coal over the Great Lakes to Minnesota, Wisconsin, and Illinois ports was maintained at a high level in 1937 but fell short of the 1936 shipments. Stocks on hand, as of December 31, continued to increase in 1937 over previous years. Shipments in 1937 will probably show a slight decline. Data on lake shipments and stocks are shown in table 12.

TABLE 12.—SHIPMENTS AND STOCKS OF LAKE CARGO COAL
(Thousands of net tons)^a

Year	Lake Erie loadings	Destination to American ports	STOCKS ON HAND, DEC. 31		
			Lake Superior docks	Lake Michigan docks	Total
1932.....	25,173	20,014	4,588	2,215	6,803
1933.....	32,333	26,065	4,130	2,449	6,579
1934.....	35,971	28,399	4,956	2,782	7,738
1935.....	35,837	28,680	4,370	2,534	6,904
1936.....	44,011	37,184	5,019	2,723	7,742
1937 ^b	43,645	35,125	5,496	2,740	8,236

^a Source of data: U. S. Dept. Interior, Bu. Mines.

^b National Bituminous Coal Commission, Monthly Coal Distribution Reports.

DISTRIBUTION OF PENNSYLVANIA ANTHRACITE

Consumption of anthracite, which at one time was an important domestic fuel in the lake shore communities of Wisconsin, Minnesota, and Illinois, continues to decline as shown by shipments in 1936 and 1937. Distribution for these years is shown in table 14.

TABLE 13.—ORIGIN OF LAKE CARGO COAL, 1931-37^a
(Thousands of net tons)

Year	Ohio	Pennsyl- vania	Mounds- ville, Ohio	Fairmont, Cumber- land Piedmont	SOUTHERN WEST VIRGINIA		
					Low volatile	High volatile	Eastern Kentucky
1931..	3,372	8,246	137	939	5,731	7,632	5,334
1932..	1,613	7,761	292	986	4,202	6,025	4,294
1933..	2,588	8,915	291	1,019	6,544	7,363	5,613
1934..	2,625	10,941	367	946	6,864	7,770	6,449
1935..	2,267	10,102	334	840	7,404	7,752	7,138
1936..	2,908	11,222	320	1,328	10,103	10,459	9,101
1937 ^b .	3,231	11,763	383	1,936	8,428	10,975	8,530

^a Source of data: U. S. Dept. Interior, Bu. Mines.

^b National Bituminous Coal Commission, Weekly Coal Reports.

TABLE 14.—DISTRIBUTION OF PENNSYLVANIA ANTHRACITE IN WISCONSIN,
MINNESOTA, AND ILLINOIS^a
(Net tons)

State	Domestic sizes		Steam sizes		Total	
	1936	1937	1936	1937	1936	1937
Wisconsin.....	372,539	354,549	89,896	75,416	462,435	429,965
Minnesota.....	110,971	94,507	10,641	26,423	121,612	120,930
Illinois.....	376,303	330,643	29,814	27,411	406,117	358,054
Total.....	859,813	779,699	130,331	129,250	990,164	908,949

^a Data from U. S. Dept. Interior, Bu. Mines, No. W. S. C. R. 48.

PETROLEUM INDUSTRY IN 1937

Petroleum production in the United States in 1937 amounted to 1,277,653 thousand barrels, or an increase of 17 per cent over the previous year. This is the highest production on record. Stocks of all major products, with exception of gas oil and distillate fuel increased in comparable amounts.

The increase in stocks of crude petroleum in 1937 over 1936 is a result of the rapid increase in output beginning in late December 1936. The extent of this increase of output is illustrated by a comparison of monthly output in 1936 and 1937 together with the output recommendations of the Bureau of Mines for the year 1937. This is shown in table 16.

TABLE 15.—STATISTICAL SUMMARY OF PRINCIPAL OIL PRODUCTS,
1936 AND 1937^a
(Thousands of barrels)

	1936	1937
Crude oil:		
Production.....	1,099,687	1,277,653
Stocks, total refinable.....	288,759	306,084
Motor fuel:		
Production.....	516,266	570,979
Stocks.....	60,437	74,650
Kerosene:		
Production.....	56,082	65,308
Stocks.....	6,938	8,907
Gas, oil and distillate fuel:		
Production.....	125,906	146,706
Stocks.....	22,813	22,566
Residual fuel oil:		
Production.....	287,968	310,161
Stocks.....	84,236	95,019

^a Data from Monthly Petroleum Statement No. 167, U. S. Dept. Interior, Bu. Mines, Feb. 9, 1938.

TABLE 16.—PETROLEUM PRODUCTION BY MONTHS, 1936-37^a
(Thousands of barrels)

Month	OUTPUT		Bureau of Mines forecast of needed oil	Difference
	1936 ^b	1937 ^c		
January.....	88,820	98,567	92,950	+ 5,617
February.....	82,120	93,173	85,920	+ 7,253
March.....	90,568	106,724	97,930	+ 8,794
April.....	90,479	104,979	97,290	+ 7,689
May.....	93,739	110,911	103,320	+ 7,591
June.....	90,185	105,812	100,980	+ 4,832
July.....	92,028	110,721	106,140	+ 4,581
August.....	95,090	115,090	107,350	+ 7,740
September.....	90,972	109,980	105,280	+ 4,700
October.....	95,795	110,911	110,610	+ 301
November.....	91,018	104,206	105,270	- 1,067
December.....	97,723	106,579	108,230	- 1,651
Total.....	1,099,687	1,277,653	1,221,270	+56,383

^a Data from Monthly Petroleum Statement, U. S. Dept. Interior, Bu. Mines, 1936 and 1937.

^b Increase, 1937 over 1936—177,966,000 barrels.

^c Increase 1937 over U. S. Bureau of Mines recommendations—56,383,000 bbls.

SOURCES OF INCREASED PRODUCTION

Practically all petroleum-producing states contributed to the increased supply of oil in 1937 with by far the most important increase being supplied by the State of Texas. Increase in 1937 over 1936, by states, and the equivalent in added days' supply for the nation on a basis of daily demand of 3.2 million barrels are shown in table 17.

TABLE 17.—INCREASE IN PRODUCTION OF PETROLEUM, 1937
OVER 1936, BY STATES^a
(Thousands of barrels)

State	Increase, 1937 over 1936	Added days' supply
Texas.....	83,321	26.0
California.....	23,748	7.0
Oklahoma.....	22,369	7.0
Kansas.....	12,344	3.9
New Mexico.....	11,574	3.6
Louisiana.....	10,019	3.1
Wyoming.....	4,121	1.3
Michigan.....	4,000	1.3
Illinois.....	2,951	0.9
Pennsylvania.....	2,085	0.6

^a Source of data, Monthly Petroleum Statement No. 167,
U. S. Dept. Interior, Bu. Mines.

Increases in Arkansas and Indiana were negligible and losses were recorded for Colorado, Kentucky, Montana, New York, Ohio and West Virginia.

In spite of the substantial increase in output, the contribution of Illinois toward an increase of stocks of petroleum and refined products has been negligible. The increase affected by production in the newly discovered fields in Illinois is shown by a monthly comparison of output in 1936 and 1937, given in table 18.

TABLE 18.—PETROLEUM PRODUCTION IN ILLINOIS, 1936-37^a
(Thousands of barrels)

Month	1936	1937
January.....	325	368
February.....	291	343
March.....	296	410
April.....	347	386
May.....	389	416
June.....	383	463
July.....	402	530
August.....	380	674
September.....	386	849
October.....	393	912
November.....	363	990
December.....	417	1,085
Total.....	4,475	7,426

^a Source of data, Monthly Petroleum Statements, Nos. 156-167, U. S. Dept. Interior, Bu. Mines.

The posted price of crude oil in Illinois during 1937 was \$1.23 per barrel until January 28, 1937, after which the price was raised to \$1.35 per barrel.

MARKET FOR PETROLEUM PRODUCTS

Consumption of major oil products in Illinois amounted to 47 million barrels in 1936 and is estimated at 52 million barrels in 1937. Gasoline continues to be the most important oil product used, followed by oil for domestic and commercial heating. The smallest of the specialized oil markets is that of range oil but this is of particular interest because of the rapid expansion of this market within a few years and the continuing expanding sales of small oil burners using this type of oil.

The five refinery products included in this table represent approximately 91 per cent of the crude oil required for their manufacture. On this basis, the estimated crude requirements for Illinois were 54,500,000 barrels and for the entire group of states, they were 130,000,000 barrels, in 1936.

Table 19 shows the demand for principal products in Illinois and adjacent states—Indiana, Wisconsin, Minnesota, and Iowa. Data on consumption of

TABLE 19.—SUMMARY OF DEMAND FOR PRINCIPAL OIL PRODUCTS IN 1936 WITH ESTIMATES FOR 1937, ILLINOIS AND ADJACENT MARKET STATES (INDIANA, WISCONSIN, MINNESOTA, AND IOWA)^a
(Thousands of barrels)

Product	Illinois	Adjacent States	Total
Gasoline			
1936.....	28,379	47,786	76,165
1937.....	30,794	51,602	82,396
Heating oils			
1936.....	11,505	9,250	20,755
1937 (est.).....	13,000	10,450	23,450
Residual fuel oil			
1936.....	6,846	8,188	15,034
1937 (est.).....	7,250	8,680	15,930
Range oil			
1936.....	555	641	1,196
1937 (est.).....	665	775	1,440
Total of above products			
1936.....	47,285	65,865	113,150
1937 (est.).....	51,709	71,507	123,216
Estimated crude requirements to meet above demand			
1936.....	54,500	75,750	130,250
1937.....	59,500	82,200	141,700

^a Minerals Yearbook, 1937, U. S. Dept. Interior, Bu. Mines.

gasoline by states is available for 1936 and 1937. For other major products, data on consumption is available for 1936 and is estimated for 1937.

For heating oils, an increase of 13 per cent in 1937 over 1936 is assumed, based upon past records of growth of the heating oil market. For residual fuel oil, an increase of 6 per cent in 1937 over 1936 is estimated on a basis of increased industrial activity in the latter year. For range oil, an increase of 20 per cent is assumed, based upon the rapidly expanding use of this product during the depression and immediately after.

The crude petroleum requirements estimated to meet the above needs are calculated on a basis that the above products are equal to 91 per cent of the crude oil required to produce them.

CONSUMPTION OF GASOLINE

The growth of the gasoline market for the past five years is shown in table 20.

Heating oils increased 66 per cent from 1934 to 1936; oil for industrial fuel use increased 22 per cent; fuel for oil company use increased 5 per cent.

RANGE OILS

Consumption of range oil is small but increasing rapidly. Data by states are available for the years 1934-36. In the Illinois oil market area, consumption is shown in table 22.

TABLE 20.—GASOLINE CONSUMPTION BY STATES, 1933-37^a
(Millions of gallons)

Year	Illinois	Indiana	Wisconsin	Minnesota	Iowa	Total
1933	971	439	387	402	356	2,555
1934	1,026	465	421	432	404	2,748
1935	1,069	497	442	443	421	2,872
1936 ^b	1,192	561	504	481	460	3,198
1937 ^b	1,293	613	541	510	504	3,461

^a Data from Minerals Yearbook, U. S. Dept. Interior, Bu. Mines.

^b Am. Petr. Inst., Petroleum Facts and Figures, Fifth Ed., 1937.

TABLE 21.—CONSUMPTION OF OIL FUELS FOR COMMERCIAL AND DOMESTIC HEATING, FOR INDUSTRIAL USE, AND FOR OIL COMPANY USE, 1934-36, IN ILLINOIS, INDIANA, WISCONSIN, MINNESOTA, AND IOWA
(Thousands of barrels)

	1934	1935	1936
Heating oil	12,478	15,007	20,755
Industrial use	8,912	9,815	10,888
Oil company use	3,978	4,503	4,146
Total	25,368	29,325	35,789

TABLE 22.—CONSUMPTION OF RANGE OIL IN ILLINOIS, INDIANA, WISCONSIN,
MINNESOTA, AND IOWA, 1934-36^a
(Thousands of barrels)

Year	Illinois	Adjacent States	Total
1934.....	75	474	549
1935.....	305	574	879
1936.....	555	641	1,196

^a Source of data, Mineral Market Report No. M.M.S. 600, U. S. Dept. Interior, Bu. Mines, Oct. 26, 1937.

HEATING OILS

Heating oils account for 58 per cent of the consumption of gas oil and residual fuel oils in Illinois and adjacent states. In 1936 the Bureau of Mines attempted for the first time to divide the light and heavy heating oils into separate stems. This was done at the request of the oil industry in order that data should be obtained to show how much of the heating oil demand was supplied from the gas oil-distillate fuel group and how much was supplied from the refinery fraction known as residual fuel oil. The marketer's classification of oil of grades 1 to 4 are obtained mainly from the refinery group known as gas oil and distillate fuel and market grades 5 and 6 represent the heavier residual fuel oils. The rapid growth in heating oil consumption in Illinois and adjacent states as compared with oil for industrial purposes, and for oil company use is shown in table 21.

Consumption of heating oils increased 66 per cent from 1934 to 1936; oil for industrial fuel increased 22 per cent, and oil for company use increased 5 per cent.

Consumption of heating oil, by states, for the years 1934 to 1936, and by grades of oil for 1936 is shown in table 23.

Three fourths of the heating oil consists of grades 1 to 4 obtained from the gas oil and distillate fuel fraction. The importance of this fraction as a major

TABLE 23.—FUEL OIL USED FOR COMMERCIAL AND DOMESTIC HEATING^a

	1934	1935	1936		
			Grades 1 to 4	Grades 5 to 6	Total
Illinois.....	7,348	8,324	8,084	3,421	11,505
Indiana.....	971	1,103	976	511	1,487
Wisconsin.....	1,776	2,227	2,397	720	3,117
Minnesota.....	2,002	2,497	2,803	636	3,439
Iowa.....	651	856	936	271	1,207
Total.....	12,748	15,007	15,196	5,559	20,755

^a Source of data, Mineral Market Report No. M.M.S. 600, U. S. Dept. Interior, Bu. Mines, Oct. 26, 1937.

source of heating oils and the rapid increase in consumption in the heating oil market raises the question of future adequacy of supply at or near present prices.

Due to a rapid expansion of oil production in 1936 and 1937 over 1935, production of gas oil and distillate fuel was able to keep pace with consumption, and no general shortage occurred. Production, consumption, and available stocks at the end of the year for the period 1935 to 1937 are shown in table 24.

TABLE 24.—PRODUCTION OF GAS OIL AND DISTILLATE FUELS IN THE ILLINOIS-INDIANA-KENTUCKY REFINERY DISTRICT, AND TOTAL PETROLEUM PRODUCTION FOR THE UNITED STATES^a

(Thousands of barrels)

Year	Petroleum production	GAS OIL AND DISTILLATE FUEL		
		Production	Consumption	Stocks, Dec. 31
1935.....	996,596	11,867	12,921	1,776
Monthly average...		989	1,077	
1936.....	1,099,687	16,174	15,442	2,508
Monthly average...		1,346	1,287	
1937.....	1,271,653	17,033	17,003	2,538
Monthly average...		1,419	1,417	

^a Data from Monthly Petroleum Statements, 1935, 1936, and 1937, U. S. Dept. Interior, Bu. Mines.

However, the margin of stocks to meet current demand may at times become very narrow. This was particularly noticeable during the severe winter of 1935-36 when stocks in February fell below two weeks' heating demand. Under normal conditions, there has been no threat of a shortage despite increased consumption. The conditions of production, stocks and consumption in the critical month of February for three successive years are shown in table 25.

TABLE 25.—PRODUCTION, STOCKS AND CONSUMPTION OF HEATING OILS IN THE ILLINOIS-INDIANA-KENTUCKY REFINING DISTRICT, FOR THE MONTH OF FEBRUARY, 1935-38^a

(Thousands of barrels)

Year	Production	Stocks at end of month	Consumption
1935.....	813	2,012	1,063
1936.....	1,699	907	1,940
1937.....	1,344	2,000	1,561
1938.....	1,390	2,051	1,599

^a Monthly Petroleum Statements, 1935, 1936, and 1937, U. S. Dept. Interior, Bu. Mines.

Use of oil for heating purposes will probably not show such a rapid growth in 1938 as in previous years. There appears to be some falling off in the rate of

oil burner installations. The record of shipments of oil burners to markets in the United States, for four years, is as follows:

Year	Shipment of burners ^a
1934.....	96,633
1935.....	134,649
1936.....	192,274
1937.....	187,180

^a Monthly report of Bureau of the Census, Washington, D. C.

MARKET FOR RANGE OIL

The fuel sold as range oil is usually a kerosene, although in some markets it varies from kerosene to grade 1 fuel oil. The use of range oil for room heating, hot water heating and cooking began in recent years in the New England states, when lowered incomes made it imperative to save on fuel costs. The market for this type of fuel, though small, appears to be expanding rapidly, especially in eastern states. The sale of range oil, by regions, in 1934 to 1936, is shown in table 26. The market for range oil in the Illinois oil market area is shown in table 27.

TABLE 26.—SALES OF RANGE OIL BY REGIONS, 1934-36^a
(Thousands of barrels)

Region	1934	1935	1936
Pacific Coast.....	459	548	596
Rocky Mountain.....	43	67	80
North Central.....	951	1,522	1,944
South Central.....	331	937	1,222
New England.....	9,912	12,530	14,505
Middle Atlantic.....	3,869	5,208	8,036
South Atlantic.....	191	714	909
Total.....	15,756	21,526	27,292

^a Data from Mineral Market Reports No. M.M.S. 600, U. S. Dept. Interior, Bu. Mines, Oct. 26, 1937.

TABLE 27.—RANGE OIL CONSUMED BY STATES^a
(Thousands of barrels)

	1934	1935	1936
Illinois.....	75	305	555
Indiana.....	21	60	79
Wisconsin.....	76	153	190
Minnesota.....	311	209	221
Iowa.....	66	152	151
Total.....	549	879	1,196

^a Data from Mineral Market Reports No. M.M.S. 600, U. S. Dept. Interior, Bu. Mines, Oct. 26, 1937.

The popularity of range oil, which first manifested itself in the New England area, is likely to spread in the Central States also. Householders are learning the value of range oil for its convenience and economy, where part-time heating is adequate, or where other fuels are not readily available. The expanding use of range oil also has brought about a decided improvement in the manufacture of burning devices for this fuel. The popularity of this type of burner is demonstrated by the rapid increase in sales since 1935. While data, by states, is not available, the record of sales in the United States is as follows:

Year	Burners
1935.....	268,840
1936.....	406,051
1937.....	466,726

Types of burners fall into two classes, i.e., perforated shell or sleeve type, and vaporizing bowl or pot type. The distribution of burner sales in the United States, in 1937, was as follows:

Perforated shell or sleeve type, total shipments.....	278,861
Complete heating units.....	103,618
Cooking units.....	12,563
Water heaters.....	10,305
Conversion burners.....	152,375
Vaporizing bowl, or pot type, total shipments.....	187,865
Complete heating units.....	168,632
Cooking units.....	3,033
Water heaters.....	7,228
Conversion burners.....	8,972

RESIDUAL FUEL OIL

Fuel oil for industrial use shows only a moderate increase in 1936 over the two previous years. This increase is probably in accord with the rising trend of industrial production and does not indicate a further extension of residual fuel oil in the industrial market. Table 28 gives the consumption of residual fuel oil in the Illinois market area for the period 1934-36, and table 29 gives detailed uses for the year 1936.

TABLE 28.—FUEL OIL CONSUMPTION, BY STATES, 1934-36, AND
1937 ESTIMATES^a

(Thousands of barrels)

	1934	1935	1936
Illinois.....	13,206	15,037	18,351
Indiana.....	6,199	6,935	7,450
Wisconsin.....	2,415	2,992	4,022
Minnesota.....	2,796	2,986	4,093
Iowa.....	1,032	1,378	1,873
Total.....	25,648	29,328	35,789

^a Mineral Market Reports No. M.M.S. 625, U. S. Dept. Interior, Bu. Mines, Jan. 27, 1938.

TABLE 29.—CONSUMPTION OF RESIDUAL FUEL OIL, BY USES IN THE ILLINOIS OIL MARKET AREA, 1936^a

(Thousands of barrels)

State	Rail-roads	Vessels	Gas and electric plants	Smelters and mines	Manufacturing	U. S. Army and Navy	Oil Companies	Miscellaneous	Total
Illinois.....	358	21	297	82	3,769	104	1,983	232	6,846
Indiana.....	46	167	228	113	3,223	1	2,160	25	5,963
Wisconsin....	19	26	226	32	562	1	5	34	905
Minnesota....	21	.....	109	9	435	2	3	75	654
Iowa.....	73	.....	280	2	194	.....	8	109	666
Total.....	517	214	1,140	238	8,183	108	4,159	475	15,034

^a Data from Mineral Market Reports No. M.M.S. 625, U. S. Dept. Interior, Bu. Mines, Jan. 27, 1938.

OIL SUPPLY

For the supply of oil to consumers in the Illinois oil market area, refineries are located in the Chicago area, in southeastern Illinois, in the St. Louis area, and at scattered points elsewhere. The Illinois refineries are included by the Bureau of Mines, for statistical purposes, in the Central West refining district which comprises Illinois, Indiana, Kentucky, western Ohio and Michigan. The total capacity of the refineries in this district is 522,530 barrels daily, of which 248,500 barrels capacity, or 47.6 per cent is located in the Chicago industrial area in Cook and Will Counties, Illinois, and Lake County, Indiana. This refining district, therefore, is the principal center of supply of refined products. The distribution and capacity of refineries in the Central district are as follows:

Location	No. of plants	Daily capacity (Barrels)
Chicago district (including Indiana)....	15	248,500
Other Illinois.....	6	98,500
Ohio.....	13	85,430
Kentucky.....	8	27,600
Michigan.....	23	62,500
Total.....	65	522,530

The largest aggregate and individual capacities are located in the Chicago industrial area including Lockport and from these plants are shipped oil products to the heavily populated districts bordering Lake Michigan. The other important refinery locations in Illinois are in the St. Louis area near Alton and in the southeastern Illinois field. Refineries in Indiana are all located in the Chicago industrial districts with the exception of a small refinery of 200 barrels daily capacity, located at Troy.

Refineries in Kentucky are all small in size, the largest being at Latonia, near Cincinnati, Ohio, with a capacity of 8000 barrels. These refineries probably serve a local market and do not extend their activities into the Illinois area.

The principal refineries in western Ohio affecting the Central States' oil market are concentrated mainly in the Toledo area with smaller refinery capacity located at Findley and Lima. About 80 per cent of this refinery capacity is located at Toledo. A portion of the Minnesota oil market is supplied by these refineries through shipments over the Great Lakes through the Sault Ste. Marie canal. The extent of this market is indicated by shipments of oil products through the American and Canadian canals at Sault Ste. Marie, Michigan and Ontario, for the period 1931 to 1937.

TABLE 30.—SHIPMENTS OF OIL PRODUCTS THROUGH THE AMERICAN AND CANADIAN CANALS AT SAULT STE. MARIE, MICHIGAN AND ONTARIO, 1931-37^a

(Barrels)

Year	American canal	Canadian canal	Total
1931.....	2,040,000	117,000	2,157,000
1932.....	3,120,000	62,200	3,182,200
1933.....	.....	.....	3,160,000
1934.....	3,109,700	322,000	3,431,700
1935.....	3,380,000	422,000	3,802,000
1936.....	3,141,600	512,500	3,654,100
1937.....	3,620,298	441,090	4,061,388

^a Statistical reports of lake commerce passing through canals at Sault Ste. Marie, U. S. Army Corps of Engineers.

The Michigan refineries are mainly small plants, the largest having a daily capacity of 8000 barrels with an average daily capacity of less than 3000 barrels for the 23 refineries. The market outlets are probably largely local.

Summary.—The refining centers mainly concerned with the supply of oil products into Illinois markets are those located in Chicago, Alton, and south-eastern Illinois. These refinery centers also extend their market operations into Missouri, Iowa, Minnesota, Wisconsin, and Indiana.

SOURCES OF OIL

Since the production of oil in Illinois and Indiana is far below the market requirements for refined products in the area, considerable quantities of crude petroleum are imported from producing fields in the mid-Continent.

States which ship oil to refineries in Illinois are Kansas, Oklahoma, Kentucky, Louisiana, New Mexico, and Texas. In 1936, which is the latest year for which data on interstate movement of oil are available, the U. S. Bureau of Mines show receipts at refineries in Illinois as follows:

State	Barrels
Oklahoma.....	24,651,000
Texas.....	3,720,000
Illinois.....	4,213,000
Other.....	7,658,000
Total runs to stills.....	40,242,000

With an estimated demand of 54,500,000 barrels of crude needed in 1936 to produce the refined oil requirements of Illinois, there is an apparent net importation of these products equivalent to 14,000,000 barrels of crude from refineries in other states. Most likely this is supplied by the Indiana refineries in the Chicago industrial district.

NATURAL GAS

The consumption of natural gas in the Illinois coal market area continued its upward trend in 1937. Total sales of natural gas in Illinois amounted to 77,000¹ million cubic feet as compared with 72,516 million cubic feet in 1936. Detailed data for gas consumption by uses, and by states in the Illinois fuel market area for 1937 are not yet available. Distribution of gas for the years 1934 to 1936 is given in table 32.

TABLE 31.—CONSUMPTION OF NATURAL GAS IN THE ILLINOIS COAL MARKET AREA, 1936^a
(Millions of cu. ft.)

	Illinois	Iowa	Missouri	South Dakota	Nebraska
Domestic and commercial....	22,468	4,643	13,962	2,119	5,810
Field.....	959		189		
Petroleum refineries.....	231				
Electric utility plants.....	2,033	4,541	4,862	878	2,981
Industrial, other.....	46,825	11,734	21,111	2,064	7,989
Total.....	72,516	20,918	40,124	5,061	16,780

^a U. S. Dept. Interior, Minerals Yearbook, 1937, Bu. Mines, p. 1080.

BUILDING MATERIALS

The building industry is slowly reviving from a virtually stagnant condition of 1932. Progress has been somewhat erratic and halting, but the trend is upward. This condition is not unexpected in view of the long period of economic uncertainty through which the nation is slowly passing. Expenditures for dwellings, under such conditions, lag considerably behind that of purchases for more immediate necessities. This, however, must not obscure the fact that building

¹ Illinois Gas Utilities, a comparative study of 1937 sales, Research Bulletin 25, Illinois Commerce Commission.

TABLE 32.—NATURAL GAS IMPORTED INTO THE ILLINOIS COAL MARKET AREA, 1934–36^a
(Millions of cubic feet)

From	1934	1935	1936
To Illinois			
Oklahoma.....			18
Kansas.....	2,019	2,107	2,385
Louisiana.....	10,971	13,574	17,214
Missouri.....	164	163	53
Texas.....	29,952	39,886	51,800
Kentucky.....	111	110	89
Indiana.....	3	34	95
Total.....	43,220	55,874	71,654
To Missouri			
Kansas.....	4,716	3,799	6,896
Louisiana.....	9,274	10,517	12,205
Oklahoma.....	2,880	6,342	7,474
Texas.....	12,597	12,024	13,284
Total.....	29,467	32,682	39,859
To Iowa			
Kansas.....	5,617	6,980	6,964
Texas.....	11,019	12,096	13,954
Oklahoma.....		1	
Total.....	16,636	19,077	20,918
To Nebraska			
Kansas.....	6,323	7,727	8,555
Oklahoma.....	181	455	507
Texas.....	5,473	5,454	6,814
Wyoming.....	812	675	904
Total.....	12,789	14,311	16,780
To Minnesota			
Kansas.....	3,621	6,025	6,141
Oklahoma.....		2	
Texas.....	3,504	4,552	5,777
Total.....	7,125	10,579	11,918
Grand Total.....	109,237	132,552	161,129

^a U. S. Dept. Interior, Bu. Mines, Mineral Market Reports.

activity must eventually be resumed, not only to replace structures which have depreciated below the point of occupancy but also to provide needed additional housing facilities for a growing population, both generally, and in specific areas. The interest that was stimulated in housing as a means of providing employment during the prolonged period of economic distress, while not as fruitful of results as was hoped, did at least bring about development of new materials for use by the construction industries, and also brought to light the necessity of meeting certain changing conditions.

The principal changes that are evident in the building industry today compared with the previous cycle of active building activity which preceded the industrial decline in 1930 are:

- (1) Changes in relative supply of building materials,
- (2) Development of new products,
- (3) Proposed development of new building methods.

Probably the most significant although least apparent of the changes that should be noted is the relative decline of wood as a building material and the substitution of clay products, concrete, and to a lesser extent steel and glass. The significance of this decline lies in the fact that in the past wood has been the most widely used construction material for dwellings and small structures and as the most important competitor of structural clay products. It still leads the field in building materials for this type of construction but a tendency toward the use of brick, particularly as a supplementary material as in brick veneer structure, is increasing.

The fundamental factor in the changing ratio of wood to brick is the declining supply of timber in the wood producing regions of the Central West. The principal source of timber is the southern forest area followed by supplies from the Central West and the Lake States. Only in the south does the annual timber cut exceed the quantity available for export to other districts. Surveys show that the southern timber region is rapidly being depleted and the present available surplus will be converted into a deficiency. When this condition arrives, there will remain in the United States but one region of lumber production where annual cut is in excess of local demand—the Pacific Coast. The timber needs of the Middle West must then be supplemented by shipments from the Pacific Coast. This will result in an upward readjustment of prices which must at least equal cost of production plus freight rates from the Pacific Coast to points in the Middle West. The competitive relationships of wood and other materials will then be changed in favor of the latter.

NEW MATERIALS

The period of the depression and quiescence in building activity served to stimulate research in the development of new materials of construction, some of which are proving practical and will enter into construction work. Among

those that should be mentioned are asbestos shingles, glass bricks, sheet steel, rostone, etc. Most of the new materials offered to the building industry are in the nature of supplementary materials designed to conserve heat, improve lighting conditions, and in other ways add to the standards of comfort. Materials such as rostone and sheet steel are designed to replace existing materials for outer walls, but do not appear to have had wide acceptance. Within the field of earth materials, the most important materials continue to be brick and concrete with an increasing interest shown in stone veneer in districts where suitable material is available. The use for glass brick in portions of a building where diffused light is desired probably offers an increasing outlet for this relatively new type of product.

DEVELOPMENT OF NEW BUILDING METHODS

Changes in building methods of a new and radically different nature have not evolved. Trends toward increased mechanization in material handling and construction is apparent but are not of a nature to affect building costs substantially.

BUILDING ACTIVITY

Building activity in Illinois, as measured by value of building permits issued in 16 Illinois cities and in St. Louis, Missouri, shows an increase of 28 per cent over 1936. Notable increases were recorded in Chicago, Cicero, East St. Louis, Elgin and Moline, while decreases in building activity occurred in Decatur, Oak Park, Peoria, Quincy, Rock Island and Springfield. The record of building permits for the years 1935 to 1937 in selected Illinois cities is given in table 33.

TABLE 33.—VALUE OF BUILDING PERMITS IN SELECTED ILLINOIS CITIES AND ST. LOUIS, MO., 1935-37^a

City	1935	1936	1937
Aurora	\$ 250,270	\$ 537,779	\$ 741,477
Bloomington	379,122	300,615	477,534
Chicago	12,936,409	19,007,332	28,806,443
Cicero	198,240	200,000	748,820
Decatur	588,102	872,839	792,646
East St. Louis	869,123	392,083	933,838
Elgin	217,945	499,401	1,226,555
Evanston	947,750	2,108,200	3,128,050
Freeport	229,090	272,252	336,777
Moline	335,893	619,238	1,982,512
Oak Park	626,200	1,491,575	988,625
Peoria	1,791,342	4,649,580	2,386,806
Quincy	95,065	224,820	181,776
Rockford	374,065	1,191,295	1,326,440
Rock Island	332,906	1,499,587	1,336,300
Springfield	456,453	2,887,557	1,624,587
St. Louis, Mo.	11,355,867	13,775,132	8,735,111
Total	\$32,083,842	\$50,539,285	\$55,754,297

^a Commercial and Financial Chronicle, Jan. 22, 1938, p. 6.

CLAY PRODUCTS

The value of clay products, including pottery, amounted to \$11,753,146 in 1937, a slight increase over 1936. The value of output from 1934 to 1937 is shown in table 34, and the value by principal products for 1937 is shown in table 35.

The year 1937 opened with a brisk demand for structural clay products which continued until midyear, after which there was a sharp decline. This is illustrated in table 36 showing the record of monthly shipments of common brick, face brick and hollow building tile in Illinois in 1937.

TABLE 34.—VALUE OF CLAY PRODUCTS, 1934-37

Class	1934	1935	1936	1937
Structural and refractory clay products.....	\$4,498,960	\$4,555,624	\$8,625,364	\$8,711,062
Pottery.....	1,446,239	2,264,521	2,888,047	3,042,084
Total.....	\$5,945,199	\$6,820,145	\$11,513,411	\$11,753,146

TABLE 35.—PRODUCTION OF CLAY PRODUCTS, BY CLASSES, 1937

Products	Quantity	Value	Quantity Stocks on hand Dec. 31, 1936
Common brick (M).....	178,641	\$1,781,364	72,795
Face brick (M).....	77,047	1,317,749	31,177
Hollow brick (M).....			
Hollow building tile (tons).....	62,668	275,031	19,587
Vitrified brick or block for paving (M).....	9,079	216,644	4,246
for other purposes (M).....			
Drain tile (tons).....	56,543	412,906	10,094
Fireclay products.....		1,239,226	
Refractory cement (clay) (tons).....	1,071	65,032	66
Clay sold, raw or prepared (etc.).....		291,549	
Other clay products (except pottery) ^a		3,111,561	
Pottery.....		3,042,084	

^a Terra cotta, sewer pipe, flue lining, wall coping, and nonclay refractories included under "Other clay products, except Pottery."

Decline in shipments of structural clay products was apparently accompanied by reduced production schedules since stocks on hand on December 31, 1937 showed no appreciable change from the previous year with the exception of face brick which showed an increase.

TABLE 36.—SHIPMENTS OF CLAY PRODUCTS IN ILLINOIS IN 1936, BY CLASSES*

Month	Number plants	SHIPMENTS		Stocks on hand at end of month (Thousands)
		Thousands	Value	
Common Brick				
January.....	40	10,544	\$ 98,924	68,789
February.....	40	11,015	108,615	59,761
March.....	40	18,861	182,419	47,723
April.....	40	20,488	194,302	44,435
May.....	40	20,098	194,842	49,985
June.....	40	20,463	191,658	59,661
July.....	40	17,881	174,741	55,895
August.....	40	17,867	180,759	50,496
September.....	40	17,053	176,571	63,149
October.....	40	18,227	187,318	66,653
November.....	40	15,079	153,019	69,914
December.....	40	9,690	98,682	73,328
Face Brick				
January.....	16	1,810	\$29,838	29,321
February.....	16	2,429	42,465	31,904
March.....	18	5,659	98,794	33,241
April.....	18	7,211	131,708	33,411
May.....	19	7,807	142,000	33,986
June.....	19	7,673	142,461	33,112
July.....	20	8,374	149,989	35,648
August.....	20	7,610	134,837	34,387
September.....	20	6,733	118,450	33,112
October.....	20	6,097	108,110	33,867
November.....	20	4,338	76,067	35,143
December.....	20	2,265	39,023	34,158
Hollow Building Tile				
		(Tons)		(Tons)
January.....	18	5,331	\$30,922	36,295
February.....	18	5,373	29,832	37,447
March.....	19	7,783	43,271	38,106
April.....	19	8,950	50,031	36,731
May.....	19	10,465	56,666	35,324
June.....	19	10,153	54,230	31,912
July.....	19	9,544	51,085	34,766
August.....	19	8,149	44,536	35,186
September.....	18	6,339	35,576	35,768
October.....	18	5,756	35,518	34,743
November.....	18	4,053	23,793	35,601
December.....	18	3,689	19,837	36,665

* Bureau of the Census, Monthly Reports on Structural Clay Products, 1937.

SAND AND GRAVEL

Production of sand and gravel in Illinois totaled 14,333,482 tons, of which 4,811,002 tons were classified as sand and 9,522,480 tons as gravel.

SILICA SAND

The quantity of glass sand produced in the United States in 1937 was 2,750,000 tons of which Illinois produced 628,020 tons. Besides Illinois, other important producing states are Arkansas, Michigan, Missouri, New Jersey, Pennsylvania, and West Virginia. High purity is required in glass sand, consequently it is not so abundant as other grades of sand. Moreover, the cost of preparing glass sand in proportion to its selling price is higher than that of molding, fire or furnace, grinding and polishing, and filter sands, consequently many firms find it more profitable to produce other sands in preference to glass sand.

The favorable reputation of Illinois silica sand as glass making material has long been recognized and a wider manufacture of glass products for markets in Chicago and other cities of the central west should be developed. In Report of Investigations No. 39¹, an analysis of the glass market in the United States and the relation to the source of raw materials in Illinois was made. In the present report, a further analysis is made of developments in the glass industry in the nation with reference to its bearing on the glass sand materials available in Illinois.

Production of flat glass products, by principal items, in 1931, 1933, and 1935, is shown in table 37. This shows a marked recovery in 1935 from the low of 1931 although production has not yet reached the peaks achieved in the decade preceding 1930.

PLATE GLASS

In general, plate glass markets may be divided into three groups; automobile, mirror, and building construction.

The automobile industry, which is localized in and around Detroit, has in recent years taken over 60 per cent in quantity of the plate glass produced in the United States.

The mirror industry, with plants located at the important furniture manufacturing centers, such as High Point and Lenoir, N. C., Grand Rapids, Mich., Bloomington, Ind., Jamestown, New York, and New York City, consumed from 10 to 15 per cent of the plate-glass output. Plate glass other than that used in automobiles and mirrors is sold in markets widely distributed throughout the United States.

¹ Voskuil, W. H., and Sweeny, A. R., Illinois Mineral Industry in 1934: Illinois State Geological Survey, Report of Investigations 39, pp. 44, 45, 1934.

TABLE 37.—FLAT GLASS AND RELATED GLASS PRODUCTS; UNITED STATES PRODUCTION AS
AS REPORTED BY THE BUREAU OF THE CENSUS, 1931-35^a

	1931	1933	1935
Flat glass and related glass products:			
Plate glass:			
Polished:			
Square feet.....	87,017,237	80,125,335 ^b	177,263,473
Value.....	\$25,765,129	\$24,037,600 ^c	\$41,818,918
Unit value.....	\$0.30	\$0.30 ^b	\$0.236
Rough (for sale as such):			
Square feet.....	(d)	(d)	(d)
Value.....	(d)	(d)	(d)
Unit value.....	(d)	(d)	(d)
Window glass:			
Square feet.....	266,772,159	249,441,799	428,938,357
Value.....	\$10,307,396	\$10,455,883	\$18,180,053
Unit value.....	\$0.04	\$0.04	\$0.04
Obscured glass including cathedral and skylight:			
Square feet.....	17,796,456		14,372,434
Value.....	\$2,388,939		\$1,644,356
Unit value.....	\$0.13		\$0.114
Wire glass:			
Polished:			
Square feet.....	1,448,284	19,858,490	11,960,829
Value.....	\$550,725	\$2,590,980	\$1,369,144
Unit value.....	\$0.38	\$0.13	\$0.115
Rough:			
Square feet.....	14,215,553		
Value.....	\$1,249,681		
Unit value.....	\$0.09		
All other flat glass, value.....			\$5,254,131
Total flat glass, value.....	\$40,261,870	\$37,084,463 ^c	\$68,266,602
Mirrors (glass), value.....	13,870,523	(^e)	13,797,368
Glass products made from purchased glass, value ^f	22,456,336	32,877,790	54,970,285 ^g
Gross total flat glass and related glass products, including duplication, value.....	76,588,729	69,962,253 ^c	137,034,255

^a U. S. Tariff Commission Rept. No. 123, 2nd Ser., 1937.^b Reported by Plate Glass Manufacturers Association.^c Estimated.^d Not reported separately.^e Not reported separately; included in "glass products made from purchased glass."^f Includes stained and leaded glass, laminated glass, plate and sheet glass, cut, beveled, decorated, etc., as well as glass laboratory apparatus, watch crystals, cut and decorated glassware and mirrors (for the years 1904, 1909, 1914 and 1933), from purchased glass.^g Value of laminated glass alone amounted to \$53,282,938.

Although the plate-glass industry exhibited a steady growth prior to 1922, its spectacular development since that time greatly overshadows the earlier period. The rapid growth since 1922 is due mainly to two factors: (1) The important changes in methods of production with accompanying reductions in cost and (2) the high rate of automobile production and the unusual activity in building construction during the period 1922 to 1930. Production capacities were greatly extended by the construction of new glass plants and the installation of new processes. Production in 1929 (150 million square feet) much exceeded that of any previous year. The recession in automobile construction and the inactivity in the building and furniture industries during the early years of the depression immediately affected activity in plate-glass production. These three industries had absorbed practically the entire output of plate glass, the automobile industry alone taking half of the total in 1929. Recovery in automobile output, together with increasing demand for safety glass, enabled the plate-glass industry to obtain new quantity production records in 1935 and 1936.

The markets for plate glass are fixed more or less by the immediate consuming industries. The Detroit industrial district, including Dearborn, Flint, and Pontiac receive more than 20 per cent of the total plate-glass output. Other important consuming centers are New York, Ohio, Pennsylvania, Missouri, New Jersey, Illinois and Wisconsin, in the order named.

Transportation.—The domestic plate-glass industry is concentrated in four districts centering in western Pennsylvania, St. Louis, Ottawa, Ill., Toledo, and Detroit. The principal producers have plants in more than one district. Shipments from these plants to the various areas of consumption in the United States are not always regulated by economy in freight rates, but in the main, the plant of any one large producer supplies a definite trade area, the boundaries of which are roughly determined by transportation costs. Operating conditions, the demand in various territories, the character of specifications, and other considerations, all have an influence on placement of orders at the various points. "Prices are quoted f.o.b. factory with freight equalization to the nearest competing factory. For example, the Pittsburgh Plate Glass Company, selling glass to an automobile factory in Detroit, would ship glass from either its Ford City, Pa., or Crystal City, Mo., plants and would absorb the amount by which the freight charges from these plants to Detroit exceed the freight charges from that competing company's plant nearest Detroit—in this case the Libby-Owens-Ford plant at Toledo, Ohio. The consumer would be required to pay only the equivalent of the freight charge from Toledo to Detroit."²

Competition.—Competitive conditions with respect to the plate-glass industry have changed materially in the past 15 years. The period 1921 to 1926 was one of great prosperity for plate-glass manufacturers, when domestic production, although increasing, lagged behind a rapidly growing demand for plate glass

² Flat Glass and Related Products, U. S. Tariff Commission, Report No. 123, Second Series, p. 109.

in the automobile and plate-glass industries. The unusual activity in those industries at that time created markets for exceptionally large quantities of plate glass at high prices.

In the next period of industrial activity, from 1926 to the beginning of the depression, there was a general expansion throughout the plate-glass industry in the United States. Old plants were enlarged and new plants built in an effort to keep pace with increasing demands. New methods of manufacture, designed especially for large-scale continuous or semi-continuous operation and for the production of more or less standard sizes suitable for the automobile market, were installed by the large domestic companies. The result was to increase plant capacities to more than 200 million square feet and average wholesale prices dropped substantially.

With reduced activity in the automobile and building industries during the depression years, the demand for plate glass greatly declined, accompanied by a decline in prices also. The revival of the automobile industry in 1933 was accompanied by a marked increase in production of plate glass. The growing use in automobiles of laminated safety glass (each unit of which requires two sheets of glass in its construction), as well as the increased production of automobiles, has accounted for the greatly increased output of plate glass since 1933. Prices, however, had declined from the high level of 1923 and remained relatively constant after the period of low output in 1930-1932. The increased demand from the automobile industry more than offset the decrease in plate-glass consumption in other industries affected by the depression. This low price was made possible through improvement in plate-glass production methods.

ROLLED GLASS

Rolled glass, broadly speaking, may be applied to all kinds of flat glass formed by some process of rolling. Rolled glass finds its principal outlet in the building industries, and, consequently, did not recover the production levels achieved by the plate-glass industry. There has been a substantial recovery in the demand for rolled glass since 1933, but shipments from manufacturers are still considerably below those for a similar period during the years immediately preceding the depression. Through the development of new processes of manufacture and through changes in the organization of the industry in the United States, producers have greatly increased their production capacity and efficiency as well as improved the quality of their product, so that they are adequately equipped to supply more than the normal demand of the country.

STRUCTURAL AND ARCHITECTURAL GLASS

The term structural glass in this discussion is restricted to (1) heavy obscured colored glass and (2) glass blocks and tile.

Heavy obscured structural glass is produced in many colors and also in a number of variegated effects, some of which resemble marble and agate. Other

decorative effects are produced by sand blasting, etching, enameling, or by inlaying with gold and silver leaf. Structural glass is being featured in modern homes for decorative and sanitary purposes, for wainscoting, trim, walls, and ceiling in bathrooms and kitchens.

The principal thicknesses of structural glass range from $1\frac{1}{32}$ inch, mainly for wainscoting and walls, to $1\frac{1}{4}$ inches for table and counter tops and exterior panels. Some of it is fire polished (by annealing) on one side with a corrugated surface on the other; other types are ground and polished on either one or both surfaces.

Although this type of glass has been produced for many years both in the United States and abroad, it is only since the modern trend in architectural design has become widespread that glass has come into favor as a structural material. Structural glass has become increasingly popular in modern office buildings, store fronts, theater lobbies as a substitute for marble, clay tile, and stone. Being nonporous and nonabsorbing, and therefore impervious to moisture, grease, and most acids, and easy to clean, this glass is being widely used as a sanitary material for walls and ceilings in hospitals and laboratories, for wainscoting and partitions in washrooms, toilet compartments, and shower baths in public buildings, and for table and counter tops in restaurants, lunchrooms, and soda fountains.

Structural glass is manufactured by a method similar to the intermittent method of producing ordinary rolled or plate glass—by casting the plastic molten glass from pots or ladles onto a flat table and then rolling it into a flat sheet. Color is obtained by the addition of chemicals to the mixture of raw materials. Because of the great variety of colors and the comparatively limited demand for any one of them, modern continuous or mass production methods of forming the sheet of glass are not readily adaptable to the production of this product.

In recent years obscured or colored structural glass has become a building material of increasing importance. Although such glass in white and black has been used for many years rather extensively for table and counter tops, its more widespread use of late for both exterior and interior walls in public buildings and in bathrooms and kitchens of homes has been a result of the trend toward modernism in architectural designs.

The demand for this type of glass both for utilitarian and decorative purposes increased rather steadily during the years immediately preceding the depression. From 1930 to 1934 however, with the decline in building construction, there was comparatively little demand for it. Since then, as a result of the upward trend in building construction and the increasing use of colored obscured glass in residences, there has been a notable recovery in domestic production. Manufacturers of structural glass encounter strong competition from manufacturers of other forms of building material, such as plate and ordinary rolled glass, clay tile, and marble and other stone.

GLASS BLOCKS

Glass blocks or bricks are new products of the glass industry, having been developed and marketed on a commercial scale in the United States only during the past 2 or 3 years. Because of their structural uses as well as the decorative possibilities which they offer, a rapidly increasing use is being found for them as a substitute for clay bricks, marble, stone, and other materials for interior and exterior walls in modern building construction.

Glass blocks are usually hollow and partially vacuumized, are made of clear glass, and possess the properties of high thermal resistance and translucency. They are easy to clean and replace, have a low maintenance cost, inasmuch as they require no finish, and are used either alone or combined with ordinary brick or other masonry. As their use often obviates the necessity for windows, glass-block masonry in modern air-conditioned buildings, it is said, will effect substantial economics in fuel consumption. The manufacture of glass blocks is still in the experimental stage, and although several methods have been devised and considerable research has been devoted to the various manufacturing problems involved, production, according to leading domestic producers, has not yet reached a satisfactory commercial basis. In general the method of producing hollow glass blocks consists of first pressing plastic glass into two similar shallow dishes or boxes and then welding these two halves under intense heat, or sealing with an aluminum alloy. The heat sets up a partial vacuum of dry rarefied air which prevents condensation within the block and adds greatly to its insulating properties. Data are not available for the total domestic output but productive capacities have been greatly increased during the past year and the demand has increased to such an extent, according to trade journal reports, that recently domestic manufacturers have experienced some difficulty in filling orders. The largest domestic manufacturer produced 600,000 blocks in 1935 and more than twice that number in 1936. Several buildings have already been constructed mainly of this material, and a number of others are contemplated.

SUMMARY

Plant capacity for the manufacture of established glass products such as plate, sheet, rolled products, furniture glass, etc., and the geographical distribution of plants is adequate to supply existing markets. A further development of the glass industry will be in the manufacture of new products among which glass bricks and glass building tile appear to offer some promise. The use of both of these types of materials will undoubtedly increase beyond past requirements with the revival of the building industry and the public acceptance of these materials as improvements or innovations in residential, office building, and industrial construction.

The advantages of northern Illinois as a glass making center were discussed in a previous Survey report.³ The nearness to such large markets as Chicago, Milwaukee, St. Louis, St. Paul and Minneapolis, as well as the smaller communities in Illinois, Iowa, Wisconsin and Minnesota as outlets for construction materials were pointed out. Fuel resources, including natural gas, coke, and fuel oil are available at reasonable costs. The development of the Illinois Waterway as an added means of transportation appears to add to the advantages of the northern Illinois glass sand district as a center of production. The entire relationships of raw material supply, transportation facilities and market outlets with respect to new glass products should be re-examined in considering the establishment of manufacturing plants for the output of products, the markets for which may be expected to increase.

OTHER USES OF SILICA SAND

The important uses of sand other than for glass making purposes are molding sand, grinding and polishing sand, fire and furnace sand, engine sand and filter sand.

Molding sand.—The output of molding sand in Illinois was 914,750 tons valued at \$855,017, as compared with a national output of 4,710,000 tons valued at \$4,990,000. The principal producers of molding sand were Illinois, Indiana, Michigan, New Jersey, New York, and Pennsylvania.

Grinding and polishing sand.—The production of grinding and polishing sand in Illinois amounted to 132,002 tons valued at \$394,263. The national output amounted to 947,000 tons valued at \$1,424,000. Pennsylvania, Michigan, Vermont, and Tennessee were the leading producers. Sand for other purposes is produced in Illinois in small quantities.

New Uses.—A new use of silica sand in Germany, in the form of quartz-glass wool, is reported by the U. S. Bureau of Mines.⁴ "It (quartz-glass wool) is said to offer advantages over ordinary glass wool, in that it has much greater resistance to high temperatures; whereas wool of ordinary glass melts at 400° to 500° C., quartz-glass wool can withstand temperatures up to almost 1200°, rendering it particularly useful for technical insulating purposes to replace asbestos and to line chemical and other equipment subjected to unusually high temperatures. Quartz-glass wool is finding increasing application for filtering purposes in the chemical and related industries because of its resistance to acids and to marked and sudden changes in temperature. By a new patented process, quartz sand is melted, and by centrifugal action a product known as 'Rotosil' (after 'rotation' and 'silicon dioxide') is obtained, and this material is used especially for lining tubes, pans, crucibles, etc., in the chemical industry."

³ Voskuil, W. H., and Sweeny, Alma R., Illinois Mineral Industry in 1934: Illinois State Geol. Survey, Rept. Inv. 39, 1936.

⁴ U. S. Dept. Interior, Bu. Mines, Mineral Trade Notes, vol. 6, no. 4, Apr. 20, 1938.

AGRICULTURAL LIMESTONE

Consumption of agricultural limestone in 1937 was 1,158,040 tons, an increase of 88,274 tons over 1936.

The sale of agricultural limestone has become more than a by-product business for many of the producers, and for their product. This was realized by many during the depression years when the agricultural limestone market, although decreasing, continued somewhat more stable than the outlets in the building and associated markets which were severely depressed.

Agricultural limestone offers a recurring business. The expansion of the present market will depend upon the appreciation of the farmer of the profitability of applying limestone to the soil. There are certain large areas in this State where the consumption is yet far below the needs of the soil, due to the original deficiency and to the annual removal of carbonates by erosion, leaching, and by the crops themselves.

Detailed statistics were received from Illinois producers and from producers in Indiana, Kentucky, Missouri, Iowa, and Wisconsin who ship agricultural limestone into Illinois. Information was also received from certain farm advisers in Illinois, supplying data for the many small local producers in those counties whose production figures were not available.

Total tonnage of agricultural limestone marketed in each county in Illinois during 1936 and 1937 is given in table 38 (pp. 44, 45). The average consumption of limestone per acre of arable land by districts (see map, p. 49) is as follows:

District	Lbs./A.
I	101.1
II	57.6
III	77.8
IV	157.9
V	107.2

MINERAL WOOL

The production of mineral wool in Illinois increased in value from \$190,000 in 1936 to \$215,000 in 1937. This increase, although moderate, is nevertheless significant in view of the fact that the industry in this State is still in the initial stages. Expansion in the industry was also retarded considerably by the sharp decrease in building activity in the latter half of 1937.

FLUORSPAR ⁵

Illinois produced 43 per cent of the fluorspar output of the United States, Kentucky produced 48 per cent, and the remainder was obtained from New Mexico, Nevada, Colorado, Arizona, New Hampshire and Utah.

⁵ Data from Mineral Market Reports No. M.M.S. 638, U. S. Department of Interior, Bu. Mines, April 20, 1938.

The tables of the U. S. Bureau of Mines (pp. 46, 47) show, for 1936 and 1937, details of the shipments of fluorspar by states and by uses, imports by countries and uses, and consumption and stocks by consuming industries.

PORTLAND CEMENT

Consumption of Portland cement in Illinois in 1937 declined slightly from the previous year. Total consumption is reported as 6,945,083 barrels as compared with 6,981,015 barrels in 1936. Production by cement mills in Illinois decreased slightly also, with an output of 4,713,000 barrels in 1937 compared with 4,950,000 barrels in the previous year. The decline in production was especially pronounced in the last quarter of 1937, with the sharp recession in building activities. The month-by-month shipments of cement from Illinois mills in 1936 and 1937 is shown in table 44, page 48.

OTHER MINERAL PRODUCTS

The distribution and trends of production from 1935 to 1937 of structural non-metallic minerals, by districts, are shown in tables 45 and 46. The districts may be identified by reference to figure 1, page 49.

Demand for the principal classes of structural materials showed only slight changes from 1936. There was a substantial increase in demand for agricultural limestone.

TABLE 38.—AGRICULTURAL LIMESTONE USED IN ILLINOIS, BY COUNTIES, DURING 1936 AND 1937

(Net tons)

County	1936	1937		Total
		Produced in Illinois	Produced in other states	
Adams.....	7,666	12,105	57	12,162
Alexander.....	302	41	150	191
Bond.....	7,900	11,619		11,619
Boone.....	6,000	501		501
Brown.....	1,000	1,907		1,907
Bureau.....	12,198	12,478	124	12,602
Calhoun.....	1,593	2,203	1,000	3,203
Carroll.....	19,000	2,200		2,200
Cass.....	2,171	910		910
Champaign.....	17,101	20,800		20,800
Christian.....	11,031	13,822	189	14,011
Clark.....	28,798	8,989	2,217	11,206
Clay.....	2,217	2,033		2,033
Clinton.....	27,625	25,552		25,552
Coles.....	7,025	3,285	518	3,803
Cook.....	7,590	12,199		12,199
Crawford.....	8,244	3,990	174	4,164
Cumberland.....	19,041	4,923	176	5,099
DeKalb.....	8,000	6,330		6,330
DeWitt.....	8,766	12,156		12,156
Douglas.....	7,906	5,452		5,452
DuPage.....	1,736	7,424		7,424
Edgar.....	2,707	3,061	2,034	5,095
Edwards.....	10,736	8,909	250	9,159
Effingham.....	21,991	10,939	873	11,812
Fayette.....	10,034	13,719	44	13,763
Ford.....	10,729	17,688		17,688
Franklin.....	4,024	9,875		9,875
Fulton.....	6,153	6,065	1,812	7,877
Gallatin.....	10,000	2,142		2,142
Greene.....	14,897	11,147		11,147
Grundy.....	2,138	5,746		5,746
Hamilton.....	2,045	4,760	313	5,073
Hancock.....	6,874	12,356	639	12,995
Hardin.....	548	2,091		2,091
Henderson.....	4,300	11,500		11,500
Henry.....	24,259	12,241	10,960	23,201
Iroquois.....	23,513	31,767		31,767
Jackson.....	6,885	12,089	123	12,212
Jasper.....	7,236	7,876		7,876
Jefferson.....	7,884	8,522	222	8,744
Jersey.....	6,789	49,022		49,022
Jo Daviess.....	10,000	2,008		2,008
Johnson.....	2,711	1,957		1,957
Kane.....	3,609	9,709		9,709
Kankakee.....	14,807	15,643		15,643
Kendall.....	6,002	9,514		9,514
Knox.....	12,882	10,406	11,012	21,418
Lake.....	1,269	2,462		2,462
LaSalle.....	12,805	28,537		28,537
Lawrence.....	3,779	2,158	1,307	3,465

TABLE 38.— (Concluded)

County	1936	1937		Total
		Produced in Illinois	Produced in other states	
Lee.....	20,752	11,676	54	11,730
Livingston.....	32,616	44,639		44,639
Logan.....	13,211	2,380		2,380
McDonough.....	4,058	3,560	1,252	4,812
McHenry.....	4,174	6,874		6,874
McLean.....	47,595	40,154		40,154
Macon.....	14,724	10,833		10,833
Macoupin.....	12,991	6,185		6,185
Madison.....	30,577	30,779		30,779
Marion.....	7,706	11,328	3,250	14,578
Marshall.....	5,907	11,265		11,265
Mason.....	10,720	6,625		6,625
Massac.....	934	827		827
Menard.....	5,745	1,629		1,629
Mercer.....	10,472	1,698	9,431	11,129
Monroe.....	11,831	40,642		40,642
Montgomery.....	11,216	15,153		15,153
Morgan.....	2,830	1,939	548	2,487
Moultrie.....	3,320	3,576	113	3,689
Ogle.....	4,000	62		62
Peoria.....	15,826	17,656	3,839	21,495
Perry.....	9,561	7,783	199	7,982
Piatt.....	6,669	9,402	292	9,694
Pike.....	20,233	1,141	981	2,122
Pope.....	7,741	3,831		3,831
Pulaski.....	820	287		287
Putnam.....	2,735	4,548		4,548
Randolph.....	24,187	24,249	3,485	27,734
Richland.....	5,917	8,911		8,911
Rock Island.....	11,707	16,447	4,391	20,838
St. Clair.....	55,823	36,489		36,489
Saline.....	5,319	4,745		4,745
Sangamon.....	2,900	6,326		6,326
Schuyler.....	2,643	823		823
Scott.....	2,200	3,400		3,400
Shelby.....	15,567	14,394	427	14,821
Stark.....	3,793	3,571	4,629	8,200
Stephenson.....	18,000	(a)	(a)	(a)
Tazewell.....	10,143	8,984		8,984
Union.....	4,689	8,608		8,608
Vermilion.....	8,174	25,530	279	25,809
Wabash.....	4,614	6,341	5,826	12,167
Warren.....	7,427	13,792	1,132	14,924
Washington.....	11,955	22,422	3,803	26,225
Wayne.....	2,807	6,876	4,300	11,176
White.....	8,161	10,555	10,092	20,647
Whiteside.....	5,796	4,407	452	4,859
Will.....	11,873	19,050		19,050
Williamson.....	2,491	2,198		2,198
Winnebago.....	30,000	3,700		3,700
Woodford.....	4,507	21,953		21,953
Total.....	1,069,766	1,065,071	92,969	1,158,040

^a Data not available.

TABLE 39.—FLUORSPAR SHIPPED FROM MINES IN THE UNITED STATES, 1936-1937, BY STATES

State	1936			1937		
	Short tons	VALUE		Short tons	VALUE	
		Total	Average		Total	Average
Illinois.....	82,056	\$1,525,606	\$18.59	78,664	\$1,730,585	\$22.00
Kentucky.....	80,241	1,409,433	17.56	87,296	1,710,122	19.59
New Mexico.....	2,045	60,858	14.59	3,324	105,733	18.02
Nevada.....	2,126			2,544		
Colorado.....	9,412	123,771	11.89	7,883	98,493	12.49
Arizona.....	40			610	21,696	14.28
New Hampshire...	257			478		
Utah.....	700			431		
Total.....	176,877	3,119,668	17.64	181,230	3,666,629	20.23

^a Revised figures.

TABLE 40.—FLUORSPAR SHIPPED FROM MINES IN THE UNITED STATES, 1936-1937, BY USES

Use	1936			1937		
	Short tons	VALUE		Short tons	VALUE	
		Total	Average		Total	Average
Steel.....	142,264	\$2,305,192	\$16.20	137,040	\$2,536,074	\$18.51
Foundry.....	2,326	36,729	15.79	2,566	47,264	18.42
Glass.....	11,014	267,290	24.27	12,697	340,187	26.79
Enamel and vitrolite.....	5,249	129,206	24.62	6,054	166,186	27.45
Hydrofluoric acid and derivatives.	12,627	326,048	25.82	17,879	481,544	26.93
Miscellaneous....	3,157	51,124	16.19	4,538	86,283	19.01
Exported.....	240	4,079	17.00	456	9,091	19.94
Total.....	176,877	3,119,668	17.64	181,230	3,666,629	20.23

^a Revised figures.

TABLE 41.—FLUORSPAR IMPORTED INTO THE UNITED STATES, 1936-1937,
BY COUNTRIES

Country	1936		1937	
	Short tons	Value	Short tons	Value
France.....	1,595	\$16,039	14,158	\$80,816
Germany.....	12,943	160,937	14,501	219,393
Italy.....			1,124	5,752
Newfoundland.....	4,317	28,497	5,520	67,723
Spain.....	5,701	31,365	566	4,464
Tunisia.....			656	8,256
Union of South Africa.....	948	19,424	538	11,223
Total.....	25,504	256,262	37,063	397,627

TABLE 42.—IMPORTED FLUORSPAR DELIVERED TO CONSUMERS IN THE UNITED STATES,
IN 1936 AND 1937

Industry	1936			1937		
	Short tons	Selling price at tidewater, including duty		Short tons	Selling price at tidewater, including duty	
		Total	Average		Total	Average
Steel.....	15,096	\$287,454	\$19.04	24,266	\$534,826	\$22.04
Glass.....	394	10,397	26.39	166	6,205	37.38
Enamel.....	544	15,428	28.36	590	21,885	37.09
Hydrofluoric acid.....	8,883	223,419	25.15	9,900	263,336	26.60
Cement.....				48	1,073	22.35
	24,917	536,698	21.54	34,970	827,325	23.66

TABLE 43.—FLUORSPAR CONSUMED AND IN STOCK IN THE UNITED STATES, 1936 AND 1937,
BY INDUSTRIES, IN SHORT TONS
(Partly estimated by Bureau of Mines)

Industry	1936		1937	
	Con- sumption	Stocks at consumers' plants Dec. 31	Con- sumption	Stocks at consumers' plants Dec. 31
Basic open-hearth steel.....	133,900	59,200	138,900	71,400
Electric-furnace steel.....	6,900	1,200	7,500	1,300
Foundry.....	1,900	700	2,500	800
Ferro-alloys.....	800	200	1,200	700
Hydrofluoric acid and derivatives.....	20,100	6,900	24,100	9,900
Enamel and vitrolite.....	5,400	1,200	5,900	1,500
Glass.....	11,600	2,300	11,600	3,200
Miscellaneous.....	1,800	900	2,600	1,300
Total.....	182,400	72,600	194,300	90,100

TABLE 44.—SHIPMENTS OF CEMENT FROM ILLINOIS MILLS IN
1936 AND 1937^a

(Barrels)

Month	1936	1937
January.....	123,914	193,072
February.....	96,972	213,010
March.....	344,791	416,763
April.....	502,111	569,124
May.....	747,219	855,215
June.....	907,061	897,783
July.....	872,104	898,682
August.....	881,077	898,523
September.....	811,715	830,163
October.....	913,472	638,401
November.....	507,209	377,691
December.....	272,665	156,579
Total.....	6,981,015	6,945,083

^a U. S. Dept. Interior, Bu. Mines, Mineral Market Reports No. 675, July 22, 1938.

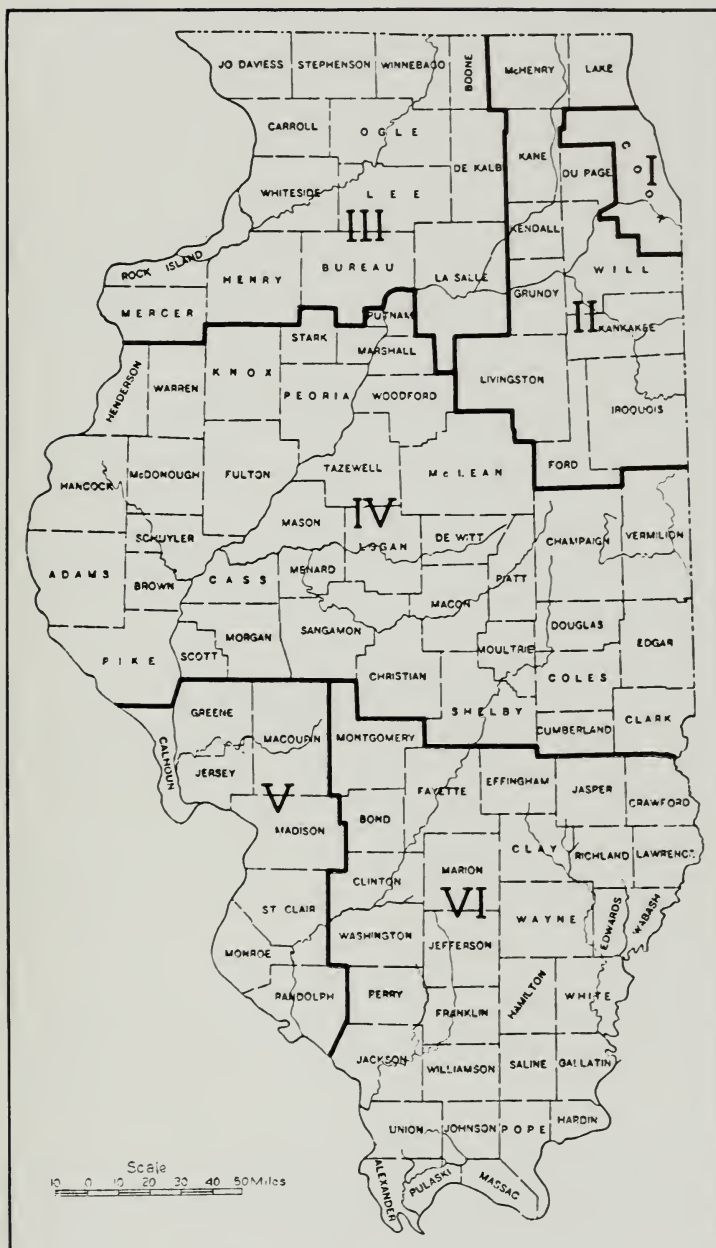


Figure 1.—INDEX MAP OF ILLINOIS SHOWING LOCATION OF DISTRICTS ACCORDING TO WHICH PRODUCTION OF SAND AND GRAVEL AND LIMESTONE, (TABLES 45 AND 46) IS GIVEN.

TABLE 45.—PRODUCTION OF SAND AND GRAVEL BY COMMERCIAL PRODUCERS IN ILLINOIS, BY DISTRICTS, 1935-37

District Number	1935		1936		1937	
	Tons	Value	Tons	Value	Tons	Value
Structural Sand						
I, II.....	569,693	\$199,084	580,219	\$214,246	285,810	\$130,490
III.....	263,561	84,321	366,493	176,748	326,136	153,521
IV.....	169,728	82,785	376,406	163,632	426,356	218,256
V.....	126,935	71,310	78,775	44,334	164,843	88,030
VI.....	27,958	16,857	113,631	60,775	54,998	29,160
Paving and Roadmaking Sand						
I, II.....	210,411	76,259	460,694	156,633	469,325	148,771
III.....	121,501	42,773	289,775	73,458	159,786	78,685
IV.....	372,627	156,696	515,491	194,992	266,469	134,822
V.....	(a)	(a)	87,963	48,675	131,785	60,856
VI.....	48,879	41,767	39,455	26,458	55,173	28,168
Structural Gravel						
I, II.....	825,082	326,372	688,276	280,133	313,329	155,835
III.....	234,821	111,458	363,714	170,744	428,770	213,032
IV.....	268,420	145,586	525,805	231,672	587,813	319,111
V.....	(a)	(a)	(a)	(a)	(a)	(a)
VI.....	42,602	24,060	36,106	25,411	45,001	21,896
Paving and Roadmaking Gravel						
I, II.....	424,338	183,666	1,009,127	351,715	1,089,571	385,922
III.....	332,754	152,804	915,074	342,171	501,967	243,905
IV.....	713,663	334,414	1,348,041	538,540	915,833	433,239
V.....	(a)	(a)	95,370	47,634	25,337	10,125
VI.....	88,633	39,845	290,158	155,598	257,845	134,425
Railroad Ballast Sand and Gravel						
I, II.....	763,584	233,205	841,133	221,865	619,440	181,821
III.....	(a)	(a)	(a)	(a)	499,261	155,998
IV.....	71,718	32,739	147,700	59,779	365,284	182,400
V.....	(a)	(a)	(a)	(a)	(a)	(a)
VI.....	(a)	(a)	(a)	(a)	(a)	(a)
Other Sand and Gravel						
I, II.....	11,368	5,374	13,431	8,188	21,118	22,200
III.....	1,210,247	1,458,365	1,508,108	1,902,276	1,825,137	2,570,501
IV.....	23,502	25,902	57,267	38,903	152,883	71,192
V.....	(a)	(a)	26,575	14,645	103,825	48,004
VI.....	55,851	29,131	57,722	41,336	309,930	144,582
Total Sand and Gravel						
I, II.....	2,804,476	1,023,960	3,592,880	1,232,780	2,798,593	1,025,039
III.....	2,404,132	1,928,128	3,969,769	2,807,433	3,741,057	3,415,642
IV.....	1,619,658	778,122	2,980,710	1,227,518	2,699,638	1,359,020
V.....	347,686	173,624	363,983	195,481	433,790	207,015
VI.....	304,283	168,966	543,191	312,332	722,947	358,231
Illinois...	7,480,235	\$4,072,800	11,440,533	\$5,775,544	10,396,025	\$6,347,847

* Concealed in total; less than three producers.

TABLE 46.—PRODUCTION OF LIMESTONE IN ILLINOIS, BY DISTRICTS, 1935-37

District Number	1935		1936		1937	
	Tons	Value	Tons	Value	Tons	Value
Road Metal and Concrete						
I, II.....	1,885,437	\$1,151,092	4,230,363	\$2,290,281	1,577,482	\$1,051,075
III.....	178,875	158,385	273,623	136,253	172,290	120,673
IV.....	93,318	94,450	192,597	180,134	149,078	149,950
V.....	705,003	606,151	726,112	607,228	409,906	376,363
VI.....	102,619	96,504	163,957	180,340	100,920	143,485
Railroad Ballast						
I, II.....	353,636	230,481	534,257	338,538	172,751	116,069
III.....			(a)	(a)	(a)	(a)
IV.....			(a)	(a)	(a)	(a)
V.....	36,010	27,091	45,779	36,773	54,000	48,708
VI.....			(a)	(a)	(a)	(a)
Agricultural Limestone						
I, II.....	115,670	70,273	671,022	457,125	389,675	295,822
III.....	14,154	12,635	13,353	15,535	4,950	4,950
IV.....	20,369	25,095	64,777	80,505	35,423	43,537
V.....	165,923	114,255	314,498	261,889	315,715	348,173
VI.....	34,465	24,677	30,115	25,506	46,359	44,976
Flux						
I, II.....	331,774	169,802	(a)	(a)	(a)	(a)
III.....						
IV.....	449	661	(a)	(a)	(a)	(a)
V.....	4,019	5,104	15,355	7,759	(a)	(a)
VI.....	(a)	(a)	(a)	(a)		
Rubble and Rip-rap						
I, II.....	15,257	16,555	5,519	9,165	12,576	19,145
III.....	(a)	(a)	(a)	(a)	101,360	14,889
IV.....	4,695	5,838	25,668	22,400	3,536	3,545
V.....	112,029	112,526	101,496	108,900	54,323	92,025
VI.....	(a)	(a)	(a)	(a)	6,284	8,644
Miscellaneous						
I, II.....	24,508	32,456	30,866	52,394	211,144	151,493
III.....			3,095	5,590	23,900	31,004
IV.....	18,396	40,056	18,647	54,667	28,406	53,083
V.....	30,877	52,091	117,413	150,014	273,361	400,976
VI.....					(a)	(a)
Total Limestone						
I, II.....	2,861,466	1,830,141	5,897,763	3,378,003	2,375,191	1,679,257
III.....	193,429	171,420	323,123	207,388	302,500	215,516
IV.....	137,277	172,100	306,912	345,652	225,789	297,257
V.....	1,053,861	917,128	1,320,653	1,172,563	1,107,305	1,172,563
VI.....	141,367	126,440	197,649	208,782	270,461	247,712
Illinois...	4,387,350	\$3,217,319	8,046,200	\$5,312,388	^b 7,094,479	^b \$6,157,943

^a Figures concealed in total.^b WPA production (mainly road metal and rubble) of 2,813,033 tons, with a value of \$2,407,950, is included in the total for Illinois, but not in the district figures.

